GE
Intelligent Platforms

Sensor Processing

From Sonar to Radar, we have the best solution

imagination at work

At GE, sensor processing is just the beginning

The ability to capture still or moving images, radio transmissions and radar/sonar signals and to turn them into actionable information is growing rapidly in importance for military organizations around the world. The requirement is not only to capture increasing numbers and types of these analog phenomena, but to transmit them more rapidly, to process them more quickly and to deliver intelligence more swiftly than ever before.

What's needed is significant expertise and experience in analog-to-digital, A/D, digital-to-analog, and D/A conversion. GE Intelligent Platforms has that expertise and experience, and is an acknowledged leader in the field of sensor processing.

Few, if any, companies can match the breadth and depth of GE's capabilities with what may be the industry's widest and most flexible range of analog input and output boards for video compression, software defined radio (SDR), signals intelligence (SIGINT), situational awareness (SA), electronic warfare (EW) and radar/sonar.

GE's products can be used to capture or transmit analog signals from acoustic to radio frequencies, process high definition video for storage or transmission over a low bandwidth network, transmit high bandwidth data over large distances via optical links, or even process existing digital data via highly capable and power-efficient FPGA devices.

Competitive advantage

GE's sensor processing capabilities are equally applicable in medical imaging, wireless communications, and test and measurement applications – in fact, any application that needs to process sensor data. For prime contractors and systems integrators looking to bring unique value and to focus on solution differentiation and competitive advantage while minimizing cost, risk and time to market, GE offers extensive, commercial off-the-shelf (COTS) options that provide a powerful, stable, flexible hardware platform that is backed not only by GE's renowned customer support but also by unique programs designed to minimize long term cost of ownership.

Many of GE's sensor processing products – which are available for PCI Express, VPX and in PMC and XMC form factors – also benefit from GE's leadership in developing solutions for military/aerospace applications, and are available in any of five levels of ruggedization. This, together with GE's focus on minimizing SWaP – size, weight and power – means that GE solutions can be deployed with absolute confidence in harsh, constrained environments such as unmanned vehicles.

GE's product offering extends far beyond sensor processing; it includes single board computers for VPX, VME and CompactPCI in 3U and 6U form factors. Powerful, sophisticated multiprocessors for High Performance Embedded Computing (HPEC) are designed for the most demanding signal processing tasks, and are supported by GE's AXIS software development environment to shorten development timescales. GE is a pioneer in the use of GPGPU – general purpose processing using graphics processing units – technology to deliver outstanding throughput for demanding applications.

Beyond this, GE offers the industry's most advanced image processing and graphics capabilities; a broad family of secure switches and battlefield routers; and the capability to design and deliver complete, application-ready rugged subsystems.

TO FIND OUT MORE:
http://defense.ge-ip.com/products/family/sensor-processing

applications

Electronic warfare/electronic countermeasures

Software Defined Radio is an enabling technology that is revolutionizing the RF world by placing the data converters as close to the antenna as possible. GE's open architecture modules include large capacity FPGA devices for customer-specified signal processing functions.

ISR (Intelligence, surveillance, reconnaissance)

GE's high-speed A/D (analog-to-digital) XMC's, VPX, PCI Express & PMCs are integrated by major global defense contractors into signals intelligence solutions to support (ISR) applications in tactical environments.

Multifunctional radar

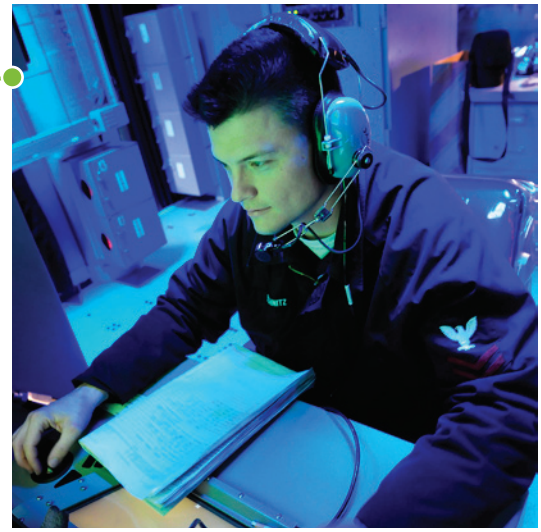
Today's sophisticated radar processing is reliant on new multi-core processors that offer outstanding performance/watt; on serial switched fabrics that offer high bandwidth board-to-board data transfers; and software tools to maximize developer productivity. GE fulfils all the requirements.

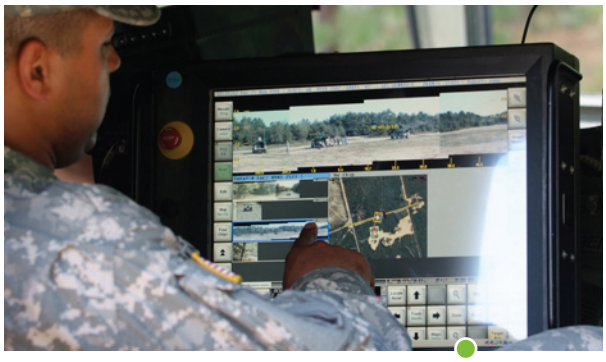
Unmanned vehicle telemetry systems

As well as being rugged enough to withstand the rigors of combat operations, GE's solutions are designed to minimize use of space, weight and power – making them ideal for deployment in harsh, constrained environments.

Spectrum monitoring

Rugged GE IF receivers are used in spectrum monitoring application to detect and locate IEDs – requiring the repeated scanning of a wide range of frequencies.





Video processing

GE offers video compression boards that provide a range of scalability, latency, and size, weight and power (SWaP) specifications, with the H.264 codec providing the most effective blend of high-quality video while achieving better than 95% compression rates to deliver low-bandwidth, low-latency, high-quality video from high-definition sources.

Signals intelligence

FPGA processors are at the heart of many of GE's sensor processing solutions, providing the computational performance and flexibility to address a broad range of demanding DSP applications in ground, airborne and naval applications including signals intelligence.

Radar/sonar

GE's products include several powerful features which are key to acoustic applications, including simultaneous sampling across a large number of channels (including channels that span multiple cards) plus reliability/redundancy features for 24/7/365 operation. The daqNet acoustic acquisition server provides high performance, higher channel density and simpler integration compared to board level solutions.

sensor processing

Video compression

GE offers a compelling range of video processing solutions for embedded applications in the military and aerospace market including data capture, processing, storage, compression, decompression and display capabilities.

The focus is on providing the features that are key to achieving high compression ratios while maintaining visual accuracy. Also, the product must target applications that requires minimal SWaP such as unmanned vehicles. By combining FPGA and DSP technologies, GE offers extensive programmability and flexibility in order to meet the needs of a wide variety of platforms and solutions.

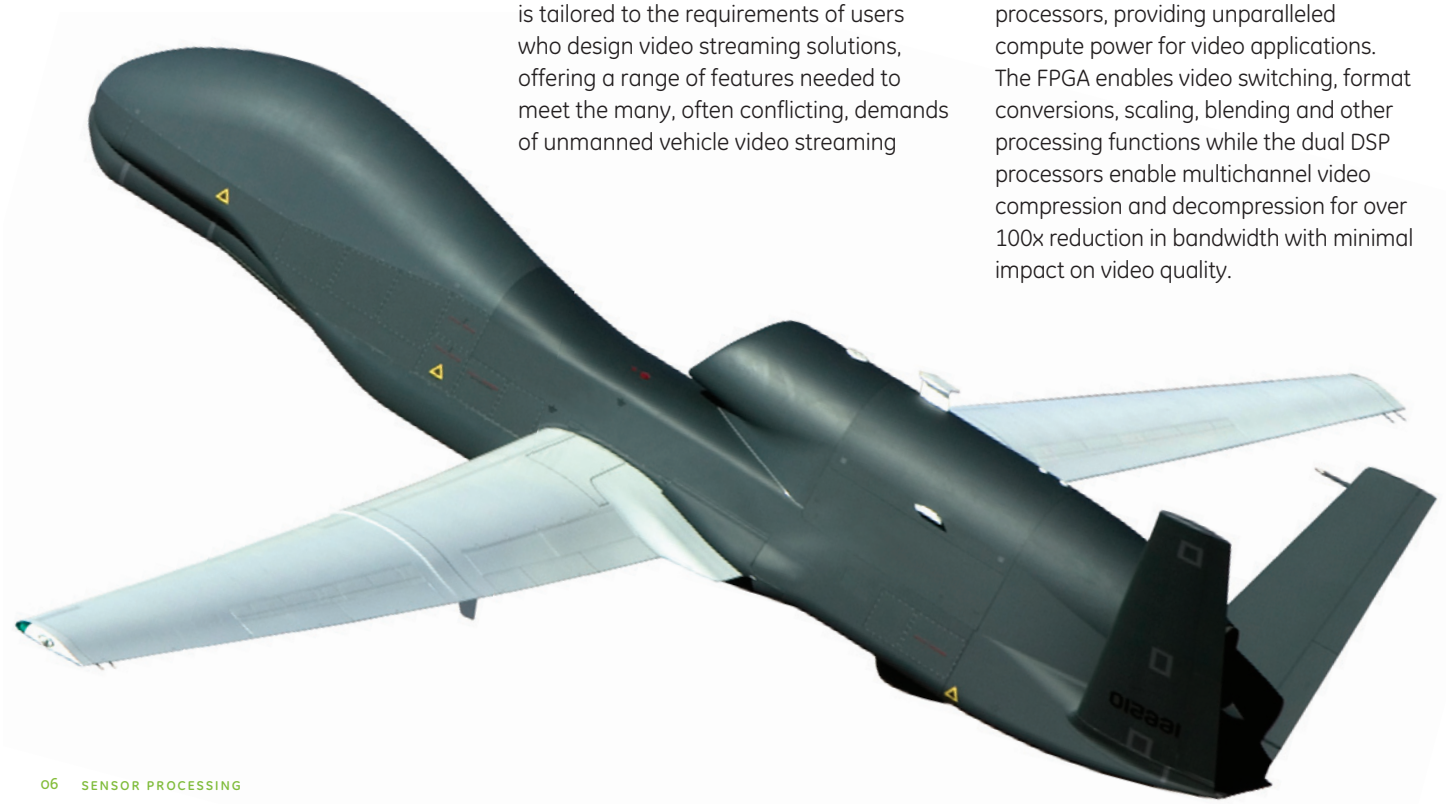
Complementing these solutions are products that deliver image fusion, graphics processing and display, and image stabilization in electro-optical systems, together with intelligent vehicle displays.

video streaming solutions

The rugged ICS-8580 video streaming XMC, for example, is highly appropriate for deployment on unmanned aerial vehicles (UAVs), such is its combination of high performance and small size and weight and low power consumption. The module is tailored to the requirements of users who design video streaming solutions, offering a range of features needed to meet the many, often conflicting, demands of unmanned vehicle video streaming applications. These demands include ultra-efficient compression, scalability, input flexibility and versatile codec settings.

The ICS-8580 can capture video inputs and archive or stream them over Ethernet, managing multiple streams and performing capture, manipulation, conversion, compression, storage, decompression and video display. It has been widely deployed in programs such as NASA's Global Hawk initiative. Featuring H.264 video compression/decompression (codec) technology, which is widely regarded as being the optimum solution (it is considered to be up to 3x as efficient as other codec solutions, allowing vital image detail to be retained while occupying the minimum possible bandwidth or storage).

At the heart of the ICS-8580 lies a combination of a versatile FPGA device coupled with powerful dual DSP signal processors, providing unparalleled compute power for video applications. The FPGA enables video switching, format conversions, scaling, blending and other processing functions while the dual DSP processors enable multichannel video compression and decompression for over 100x reduction in bandwidth with minimal impact on video quality.



TO FIND OUT MORE:
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sensor processing

Software Defined Radio

GE Intelligent Platforms Software Defined Radio portfolio includes a variety of formats such as PMC, XMC, PCI Express and VPX, with a range of sampling/conversion frequencies, resolutions, channel counts and ruggedization levels. All include high performance FPGA processors for both performance and flexibility.

Typical of GE's software defined radio solutions is the ICS-1572A ADC/DAC (Analog-Digital Converter/Digital-Analog Converter) transceiver XMC module. Designed to act as a powerful link between the analog world of sensors and the digital world of computing, it can be deployed in the most demanding radar, signals intelligence, communications and test and measurement applications.

The board features 16-bit data acquisition at up to 250MHz and the latest Xilinx® Virtex™-6 FPGA processor to deliver unprecedented performance in a cost-effective, compact, lightweight form factor.

Beyond this: not only does the XMC form factor allow for more compact solutions – it also allows for high throughput to the host memory, which translates into the ability to send high bandwidth signals for downstream processing.

The high sampling rates allow for high instantaneous bandwidth to be captured, while the use of high speed DDR3 memory allows for deep waveform storage and tolerates the interrupt latency associated with non-real time operating systems. The ICS-1572A provides two 16-bit ADCs sampling synchronously at frequencies up to 250 MHz and two 16-bit DACs at up to 500 MHz. The ADC input pass band is 4.5 to 800 MHz (3dB) to allow for under-sampling applications.

A Xilinx Virtex-6 LX240T FPGA is provided for user-defined signal processing functions, giving greater capacity than previous generations. The Virtex-6 device also provides a PCI Express® interface to the host system. Other protocols, such as Serial RapidIO™ can be provided on request. The FPGA provides a powerful signal processing capability that can be loaded with standard functions such as wideband DDC, FFT and time stamping, or programmed by the user for any required function.

Acoustic and Sonar

GE Intelligent Platforms was one of the first companies to offer commercial off-the-shelf (COTS) products for acoustic applications that include sonar, vibration analysis and test and measurement, combining the best in analog and digital technologies.

The ICS-1620 is a 16-channel, 2.5 MHz 16-bit DAC short form factor PCI Express module designed for high end acoustic applications. Ideally suited for sonar transmit and simulation applications, the ICS-1620 offers a higher output signal bandwidth than can be achieved with boards using traditional delta-sigma DACs.

The result is a product that enables the creation of high channel count and high frequency systems which previously required custom hardware. The ICS-1620 offers a customized interpolator implemented in an onboard FPGA paired with sixteen high speed DACs on a single short form factor PCI Express card, and includes the ability to synchronize up to eight cards.

The ICS-1620 has been designed to work seamlessly with the ICS-1640 high speed analog to digital converter card which allows sonar system integrators to easily develop a fully synchronized transmit and receive application. Combining the ICS-1620 with one of the SBCs, multiprocessors, and/or chassis available from GE provides a powerful platform for sonar applications.

No less representative of GE's innovative sonar solutions is daqNet, which is designed for today's network-centric environment. An autonomous high-speed acoustic data processing solution, daqNet provides data connections and control capabilities by means of a dual Gigabit Ethernet interface within a 1U form factor.

daqNet has been optimized to provide high performance, high-speed signal conversion capability for up to 192 channels of analog I/O and 240 channels of digital I/O. The redundant dual Gigabit Ethernet is easily configurable utilizing SNMP and traditional network transport protocols. An unlimited number of daqNet servers and channels can be synchronized in real-time, while GE's custom time stamping technology delivers data reliability through the elimination of lost packets. Each daqNet supports master/slave configuration for redundancy in the event of a failure. The user has the option of providing the system with an external A/D sampling clock, sync and trigger for enabling A/Ds and digital I/Os.

products

Software Defined Radio

Software Defined Radio is an enabling technology that is revolutionizing the RF world by placing the data converters as close to the antenna as possible.

GE Intelligent Platforms is at the forefront of this advanced technology with a family of state-of-the-art open architecture modules that include large capacity FPGA devices for customer-specified signal processing functions (available in PCIe, XMC/PMC and VPX formats) with sampling rates between 100 MHz and 3 GHz and resolutions from 16-bits to 10-bits. Both board-level and system-level products are offered in order to reduce time to market.

Product Name	Form Factor	Rugged	ADC			DAC			FPGA		Memory (MB)
			Channels	Max Fs (MHz)	Bits	Channels	Max Fs (MHz)	Bits	Family	Type	
ICS-8554D	PMC	✓	4	105	14				Virtex II	3Mg	2
ICS-8550	XMC	✓	2	210	12				Virtex 4	Fx60	
SPR870A	VPX	✓	2	1.5GHz	10	1	1.5GHz	12	Virtex 6	SX475T	1.5GB
ICS-1572	XMC		2	250	16	2	500	16	Virtex 6	LX240T	1GB
SPR507B	XMC/PMC	✓							Virtex 6	LX130T	1GB
ICS-1555	PMC	✓	4	180	16				Virtex 5	SX95T	2

For multi-mission and cognitive radio applications, our Software Defined Radio modules deliver processing power, plus receive and/or transmit functions in one VPX or PCIe bus slot. The Sensor Processing groups line of high performance Software Defined Radio (SDR) data acquisition modules all include Xilinx Field Programmable Gate Arrays (FPGAs) for user/factory programming of DSP algorithms, making them powerful processing elements, rather than just data producers or consumers.

Our SDR products are ideal for military communications, tactical radio, signal intelligence, radar, electronic counter measures, satellite ground stations plus transceivers and public safety equipment.

High-Speed Data Transfer Module
SPR507B – 4-channel Serial FPDP PMC/XMC Module

- Serial FPDP module offers total band width of up to 1.4 Gigabytes/second
- 30% higher speed than the industry standard
- Available either as a PMC module for upgrade legacy systems or as an XMC for modern ground up designs
- Guaranteed performance across all ruggedization levels
- Saves on SWaP

Radar Electronic Counter Measures Solution
SPR870A – 3U VPX Wideband Digital Transceiver

- Substantial SWaP savings
- Maximize troop & asset safety with high-end performance
- Smart design & will save customers months of internal hardware engineering
- Increase freedom from analog hardware maintenance
- Obvious choice for technology refresh

ADC/DAC XMC transceiver module designed for the most demanding signal intelligence applications
ICS-1572A – Digital Transceiver

- 2 Transformer-coupled Analog Inputs, 16-bits, Fs < 250MHz per channel
- 2 Transformer-coupled Analog Outputs, 16-bits, Fs < 500MHz per channel
- Xilinx Virtex-6 LX240T User Programmable FPGA standard, other devices available as an option
- PCIe x8 Master/Target Burst Mode DMA capable

Video Product Matrix

Product Name	Form Factor	Analog / Digital video input				Output			Compression Algorithm	FPGA / Processor
		Rugged	Channels	Format	Mode	Channels	Format	Mode		Type
daq8580	CRS	✓	6	VGA, SVGA, XGA, SXGA, UXGA, 525i/p, 625i/p, 720p, 1080i/p	Cameralink, Composite, Component, Svideo, HD/ SD SDI, DVI, RGB, PCIe, Audio	4	VGA, SVGA, XGA, SXGA, UXGA, 525i/p, 625i/p, 720p, 1080i/p	Composite, Component, Svideo, HD/ SD SDI, DVI, RGB, 10/100 Ethernet (IPv4 & IPv6), Audio, RS-232, RS-422	H.264 AVC/ MPEG-4 part 10	Altera Arria II GX EP2AGX190 / Texas Instruments TMSDM6467 DSP
ICS-8580	XMC	✓	4	VGA, SVGA, XGA, SXGA, UXGA, 525i/p, 625i/p, 720p, 1080i/p	Cameralink, Composite, Component, Svideo, HD/ SD SDI, DVI, RGB, PCIe, Audio	4	VGA, SVGA, XGA, SXGA, UXGA, 525i/p, 625i/p, 720p, 1080i/p	Composite, Component, Svideo, HD/ SD SDI, DVI, RGB, 10/100 Ethernet (IPv4 & IPv6), PCIe, Audio	H.264 AVC / MPEG-4 part 10	Altera Arria II GX EP2AGX190 / Texas Instruments TMSDM6467 DSP

Video Capture, Compression, Streaming and Archiving Solution
ICS-8580 2-Ch., High Definition or 4-Ch., Standard Definition H.264 Video Encoder/Decoder XMC Module

- High Performance H.264 encode/ decode with KLV metadata
- Dual HD channel encoding up to 1080p/1600x1200
- Ultra low latency
- Ruggedized enclosure

We offer state-of-the-art video processing solutions for embedded video applications in military, aerospace and unmanned vehicle markets. Our video solutions provide data capture, processing, storage, compression, decompression, and display capabilities for a wide range of applications. Using high-performance FPGA and DSP technology, our solutions deliver the performance and ease-of-use required in these demanding environments.

Acoustic

Product Name	Memory	Function	Max. Sampling/ Conversion Frequency	Channels	Resolution	Form Factor
daqNet	256 MB	Analog Input, Analog Output & Digitial I/O options	625 kHz/ch	192 Analog & 240 Digital	24-bit	1U Rackmount
ICS-1620	16MB	Analog Output	2.5 MHz/ch	16	16-bit	PCI Express
ICS-1640	16MB	Analog Input	2.5 MHz/ch	16	24-bit	PCI Express

Autonomous High-Speed Acoustic Data Processing Solution
daqNet 1U Acoustic I/O Server

- Fully integrated acoustic server in a compact 1U chassis
- Up to 192 channels of acoustic I/O or 240 channels of digital I/O
- Dual Gigabit Ethernet interfaces for data I/O modules
- Precise sampling synchronization across multiple servers
- User configurable digital I/O module with immediate, external signal or time-based trigger

We have been delivering state-of-the-art military computing SONAR solutions for more than 30 years, so it's not surprising that the industry's best prime contractors choose GE Intelligent Platforms products in many of their highest profile programs.

In addition to our invaluable experience in SONAR, our field-proven hardware offerings reach all the way from front-end data acquisition, to back-end signal processing. Our software toolset, AXIS (Advanced Multi-processor Integrated Software), enables rapid, efficient development, debugging and deployment of sophisticated, high-performance signal processing applications. It is this expertise, hardware, software that set GE Intelligent Platforms apart.

GE Intelligent Platforms Contact Information

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Global regional phone numbers are listed by location on our web site at **www.ge-ip.com/contact**

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08.12 GFA-1922